#62-500
#33-845
#33-846

NAVITEK™

OPERATING INSTRUCTIONS

⚠ CAUTION!

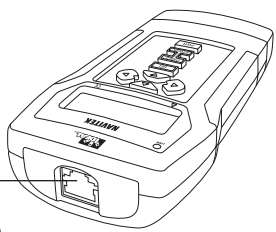
Do not attach to primary power lines. The NAVITEK™ may be damaged and become a safety hazard. When connecting to an unknown jack or plug, the NAVITEK™ should be off.

⚠ CAUTION!

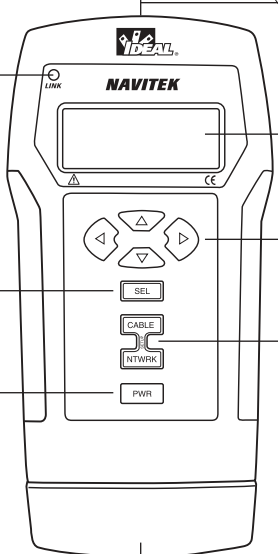
Improperly crimped, damaged or un-crimped plugs can damage the jack on the NAVITEK™. Always inspect the plugs for proper termination and crimping before inserting into the tester. Contacts on a plug should be recessed into the plastic grooves. To avoid damaging NAVITEK™'s RJ45 jack, always use the RJ45 to RJ11 adapter before inserting RJ11 patchcord.

NOTE: The screen comes with a clear, peel-off protective coating over the LCD screen that should be removed for the clearest view of the display.

Compact ergonomic design enables complete active and passive network verification from any location.



RJ45 Jack – on top of unit for easy connection to cable or jack.



Link Indicator

Back-lit LCD 2 lines by 16 characters with icons

Cursor Keys –Used to scroll through options, set addresses and adjust values.

SEL Key – used to enter displayed operating mode, start a new test, change the value of an option, enter sub-menus or move to the next screen.

Mode Keys – Press CABLE for cable modes, press NTWRK for network modes.

Pressing both keys at once will enter SETUP mode.

PWR (Power) Key – Press to turn on NAVITEK™ in the mode set at power off. Additional presses toggle the backlight on and off. Hold down to power off.

Battery Cap – press down with heal of hand to open

Kit Contents

- Standard Kit (33-846): Soft zipper bag, NAVITEK™ tester, 8 remotes, 3 RJ11 patchcords, 9 shielded RJ45 patchcords, RJ45 to RJ11 Adapter, 1 alligator clip, user manual and laminated quick reference card.
- Economy Kit (33-845): Small soft zipper bag, NAVITEK™ tester, 1 remote, 2 RJ11 patchcords, 2 shielded RJ45 patchcords, RJ45 to RJ11 Adapter, 1 alligator clip, user manual and laminated quick reference card.
- Tester Only Kit (62-500): Soft small zipper bag, NAVITEK™ tester, user manual, and laminated quick reference card.

Features

- Comprehensive testing and troubleshooting tools for structured data networks
- Verifies the integrity of the physical network and validates active network connectivity with PING and Hub blinking
- Detects port services such as Ethernet, ISDN, POTS, Token Ring
- Announces Ethernet network speed and capabilities
- Performs length measurement up to 1500 feet
- Tests UTP/STP cable to T568A/B wiremap and fault identification
- Supports four-tone generation for cable tracing
- Easy-to-read backlit LCD display

Available Test Modes

- **Cable Test Mode** (CABLE button):
  - **Cable Test:** Perform single-ended testing (with no remote attached) of cables for shorts, opens and split pairs and full cable test (with remote attached). Display PASS icon for T568A/B passing cable and report cable length, with identification for remote. For failed cable, the result is displayed in wiremap format with a message to identify split pairs (with remote attached) or shorts.
  - **Jack ID Test (Service ID Test):** Capable of detecting many services on the network: POTS, ISDN, DSL, Ethernet, & Token Ring. NAVITEK™ will automatically runs cable test if no active devices found.
  - **Cable Length Test:** Measure cable length using capacitance method in ft or meter by wire pair with remote identification.
  - **Tone Generator:** Support up to 4 tone generator mode for use for tracing and fault isolation
- **Network Test Mode** (NTWRK button):
  - **Ping Test:** Simultaneously PINGs three devices at once—a target, a router, and a DNS server. The DHCP protocol support allows for PINGing of a router and DNS server with no setup requirements.
  - **Validate Link Test:** Verify network connectivity with a message
  - **Flash Link LED Test:** Sends tone while blinking a link indicator to find a HUB or switch port

- **SETUP & Test Mode**
  (SETUP button—holding down both CABLE & NTWRK buttons):
  - Battery indicator display
  - Unit of measure change for ft or meter
  - Unit MAC Address display
  - DHCP On or Off setting
  - LAST DHCP—a sub menu for user to view the results of the most recent DHCP negotiation between NAVITEK™ and a DHCP server.
  - Ping Setup—a sub menu for IP address configuration

Network Connectivity

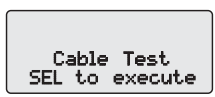
The NAVITEK™ uses IP address protocol and recognizes Auto-Negotiation using Fast Link Pulses to report advertised Ethernet capability. NAVITEK™ also supports a modified version of auto MDI/MDI-X to allow for connection to a HUB, switch or NIC with a straight through cable. The NAVITEK™ operates using 10 base-T for all network transmissions. The vast majority of 100 base-T Fast Ethernet products support 10 base-T. However, should a HUB or switch be 100 base-T only through settings or by design, a different port, a change of settings or insertion of an inexpensive 10/100 HUB in line with the NAVITEK™ will be necessary.

STEP BY STEP USE INSTRUCTIONS

To turn the NAVITEK™ off after any test, press and hold PWR button until the display turns off. The tester will turn off automatically after about 15 minutes in all modes except Tone Generator, which is 60 minutes, and Flash Link LED, which is 30 minutes. When connecting to unknown jacks or cables, it is best to begin with the power off and turn the NAVITEK™ on after the connection is made. This insures that the voltage check will be run first before any other testing.

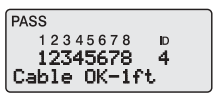
To perform Cable Test

1. Connect one end of cable run to be tested to NAVITEK™. Press CABLE button repeatedly until Cable Test is displayed (twice if unit was off). Press SEL button to enter test.



Cable Test Mode Select

2. If the cable is connected while the tester is on, a single-ended test for shorts, opens and split pairs will most likely be in progress. Press SEL button to force a new test to begin.

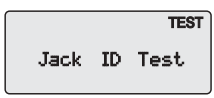


Wire Map with Remote

3. For a complete test, connect a remote to the other end of the cable. Application Hints: Any patch cables used to connect the tester and remote to a cable run must be short compared to the cable run for accurate open and split pair indication, no more than 10% of the total run length or 3 feet, whichever is less. A cable must be at least 4 feet long for single ended test to work properly.

To perform Jack ID Test (Service Detection Test)

1. With NAVITEK™ powered off, connect to unknown jack or plug.



Jack I.D.

2. Press CABLE button, NAVITEK™ will power on in Jack ID mode and determine what device is connected to the other end of the cable or test the cable if no connection is found.

To place Tone on a Cable

Tone Generator Running

1. Connect cable to be traced to main unit. Turn on tester by pressing CABLE button. Press CABLE button until Tone Generator is displayed, than press SEL button.
2. Press SEL until desired tone is selected. The up/down arrow keys select the pin or pair(s) to carry the tone.
3. For strongest signal, do not connect remote. Due to the shielding effect of twisted pairs, the strongest signal is obtained by having one wire of a pair carry tone. Selecting a single pin instead of a pair will do this.

To measure Length of a Cable

Length Measurement

1. Connect cable to main unit. A remote may be at the other end, but is not required.
2. Turn on unit by pressing CABLE button. Press CABLE button until Cable Length is displayed, then press SEL button. To change length units between feet and meters, use setup mode.
3. Press up/down arrows to adjust length constant. If length constant is unknown for a particular cable, a known length of cable may be used to set the constant. Fifty feet or more is suggested to minimize the resolution error (1 foot in 50 is 2% uncertainty). Connect known cable to tester and change the cable constant using up/down arrows until the length reads correctly.

To locate an Ethernet Port

Flash Link LED

1. With NAVITEK™ powered off, connect NAVITEK™ to a jack or plug at the workstation location for which the Ethernet port is to be located.
2. Press NTWRK button, NAVITEK™ will power up in the Flash Link LED mode and connect to the Ethernet port on a HUB, switch or NIC. Even if no connection is made, tone is generated on the cable to aid in finding the cable with a tone tracer at the other end (equipment closet).
3. If an Ethernet link is active on the cable the NAVITEK™ turns on its link LED and begins flashing it in unison with the link indicator on a port of the HUB, switch or NIC at the other end. Tone is also generated on the cable in this condition, but at a different cadence to indicate having established a link.

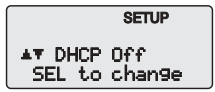
To PING Devices on a Network

Ping Status

1. With NAVITEK™ powered off, connect to network.
2. Press NTWRK button repeatedly until PING Test is displayed on screen (two presses when off). Press SEL button to enter test. Several status screens will be displayed while establishing a link and negotiating the DHCP configuration. Once PINGing begins, a PING status screen will be displayed, showing acronyms for each active conversation.

3. Press left or right arrows to move curser( ) next to a device acronym. Press SEL button to view more information about a device. There are a total of three screens to view. Press SEL button to advance to the next screen or the screen will advance automatically after 10 seconds.

To select DHCP On or OFF



Typical "Setup" Screen

1. The PING function operates in two modes DHCP On (dynamic IP) and Off (static IP).
2. This is selected in SETUP by the DHCP On/Off option. No other entries are required to establish communications with a router and a DNS server on a DHCP network.
3. To PING a specific target (Tg1-4), the address must be entered and the desired target address selected in SETUP before starting the PING test.
4. In DHCP Off mode, all IP configuration information must be entered in SETUP first.(PING Setup option)

To Validate a Cable Link by Functional Testing

Two NAVITEK™ testers can be used to exercise a cable link with no additional equipment being required. This can also be done through a HUB or switch with or without any other equipment being present. The two NAVITEK™ will be referred to as the Validator and the PING Generator. The Validator uses the Validate Link mode and the PING Generator uses PING Test mode.

1. Connect the Validator to one end of the link to be tested.
2. Press NTWRK button until Validate Link is displayed. Press SEL button to activate test.
3. In SETUP, set PING Generator to DHCP Off (see To Change PING Addressing, below). A specific manual address does not need to be set; the PING Generator will recognize the Validator and assign addressing.
4. Connect the PING Generator to the other end of the link.
5. On the PING Generator, press NTWRK button until PING Test is displayed and press SEL button to begin.
6. The target or router acronym will change to Val on the PING Generator when the Validator is found and addressing assigned. The PING Generator operates and accumulates information as in the normal PING Test. The Validator displays a packet count only on its screen.

To Change PING Addressing Mode – Other options are changed similarly.

1. Turn on NAVITEK™ by pressing PWR button and press the middle of the CABLE/NTWRK button, which is marked SETUP. The percent battery remaining screen will appear briefly.
2. Press down arrow button three times, DHCP On or DHCP Off should be displayed.
3. Press SEL button to toggle between on and off. Displayed value is current setting.
4. Press CABLE or NTWRK to exit to a test or press and hold PWR button to power off.

FUNCTIONAL DESCRIPTION

The NAVITEK™ is a jack service identifier, cable tester and PING tester in one tester. The NAVITEK™ has a backlit LCD display and eight momentary buttons. The rubber end cap at the bottom is the battery compartment cover.

The NAVITEK™ is powered on by pressing any one of three buttons: PWR, CABLE or NTWRK. The tester will turn on in the last mode used before turning off if the PWR button is pressed. If the CABLE button is pressed, the tester immediately starts executing the Jack ID (Service ID) test. Pressing the NTWRK button causes the Blink Link LED test to begin. The NAVITEK™ is turned off by holding down the PWR button until the display goes blank. The tester will also shut off automatically 15 minutes after the last button press in most modes, 30 minutes in Blink Link LED mode and 60 minutes in Tone Generator mode. Short presses of the PWR button, toggles the back light on and off. The back light turns off automatically about 5 minutes after being turned on. Using the back light increases power consumption by between 20% and 50%.

There are seven test modes and a setup function as described below. The mode switch is the double-button immediately above PWR. The top button is labeled CABLE, the bottom button is labeled NTWRK and the area bridging the two button is labeled SETUP. Pressing a mode button will immediately end any currently running task and either begin the executing the first task of a new category (cable or network) or display the next mode in the same category, waiting for a press of SEL to begin the testing. Subsequent key presses in the same category will advances the option to the next. The tester will roll over to the first mode when the end is reached, while waiting for SEL to begin.

Voltage Check – All tests, except Jack ID (Service ID), start with a check for voltages on the pins on the tester's jack. If found, the message "-Voltage Found- SEL Jack ID" is displayed, and the only option for the user is to press the SEL key to start the Jack ID test to determine what type of interface or what voltages are present on the jack. The tester monitors the jack to see if the voltage is removed for five minutes. The selected test will continue if the voltage is removed, or the tester will shut itself off after the five minutes. The exception to this behavior is in the Network Modes. When voltage is found in the network modes, the tester checks to see if it is Ethernet Phantom Power. This is a voltage which is connected to the center taps of the Ethernet interface transformers of some network equipment to power remote devices, like IP phones or wireless transceivers. This power is seen by the NAVITEK™ as voltage between the 1-2 and 3-6 pin pairs. The voltage found is reported as "Enet Pwr Source Found = xV" for several seconds, then the test proceeds automatically.

STATUS AND ERROR MESSAGES FOR NETWORK TEST MODES

ARP received – In Validate Link mode, this status shows that the tester has detected another active NAVITEK™ trying to start a PING conversation. This status flashes for a few seconds while the units negotiate an IP address they can use to PING each other.

DHCP Request – In the PING test with DHCP On, the NAVITEK™ displays this message on the first line while it is trying to get the required information from a DHCP server. The second line displays:

Attempt – count of DHCP requests sent out, if this number continues to increment, no response is being received.

Successful – Shows for a short time after the server responds to the request.

Find Active Link - The tester is searching for incoming Link pulses while waiting to start an active test. Flash Link LED and PING test modes need to be connected to an active network in order to run. In these modes, this status is displayed while the tester is searching both the 1-2 and 3-6 pairs for incoming Ethernet Link pulses. In the Validate Link mode, the NAVITEK™ assumes an active NIC configuration, generating Link pulses on the 1-2 pair. This allows another NAVITEK™ to be connected directly to it.

Link Found – Status displayed while searching for Link pulses after an incoming signal has been detected.

Link Not Found – Status displayed while searching for Link pulses and nothing has been detected.

Link word Err – The Link word captured by the NAVITEK™ during Jack ID test from an attached 100 Mbit Ethernet device decoded an unrecognized value. May indicate a cable problem or a hardware problem with the connected device.

Lost Link - A test was active, after having found incoming Link pulses, but they stopped being received. Possibly due to the cable being disconnected or the connected device being shut off.

NIC init err - The Ethernet interface chip used in the NAVITEK™ reported a problem to the CPU during internal initialization. May be caused by a hardware problem inside the tester.

NIC Rx overrun - The Ethernet interface chip used in the NAVITEK™ provides internal buffering for multiple packets. If new packets are received faster than they can be processed, the Ethernet chip discards the new packets and sets the Overrun error flag. The tester detects and reports this error. May be caused by excessive broadcast traffic on the LAN, or by externally generated packets addressed to the tester's IP address.

NIC Tx timeout - The Ethernet interface chip used in the NAVITEK™ was not able to transmit a packet within the time allowed. May be caused by a hardware problem inside the tester, a problem with the attached cable, hardware problems with the connected device, excessive LAN traffic or collisions on the LAN.

No IP address - The DHCP server responded to the tester DHCP request, but did not provide an IP address for MyIP.

Packet Rcv Err - An Ethernet packet was received by the NAVITEK™ with errors in the header or packet data. May be caused by excessive signal noise on the Ethernet cable or a hardware problem with the device transmitting to the tester.

PING Test Detailed Status Messages - these messages may be displayed when the SEL button is used to access the status details during active PINGing.

IP add = DNS add – The active Target IP address is the same as the DNS Server IP address, so the Target PING is automatically disabled.

IIP add = Rtr add – The active Target IP address is the same as the Router IP address, so the Target PING is automatically disabled.

No ARP Response – The IP address active for this conversation is being ARP'ed but is not responding. The IP address may be unused, the device may be powered off or not connected.

No PING Response – The IP address active for this conversation is not responding to PING requests. If the addressed device is on the LAN segment, it may be powered off or not connected. If the addressed device is remote, it may be inaccessible due to WAN problems, it may be powered off or the device at the Router IP address may not be forwarding the PING packets.

No Rtr Response – The IP address is off the LAN, requiring the PING to go through the Router, but the Router IP address is not responding to ARP.

No Router IP – The DHCP server did not provide an IP address for the Router

RTR must be on MyIP LAN segment – Displayed in Setup while setting the Manual Router IP address. The NAVITEK™ requires that the Router be at an IP address on the LAN segment as defined by the Netmask and MyIP addresses. Setup will not allow the Router IP address to be set to an off-LAN address.

Voltage Found, SEL Jack ID – The tester does not operate in Network modes when voltage, and possibly destructive power, is found. Voltages found will terminate the test in progress and the only option is to run the Jack ID test (by pressing SEL). The only exception to this is the possibility of an Ethernet power source providing power between the 1-2 and 3-6 pairs. In that case, the following message will be displayed.

Enet Pwr source Found = xV – Some devices provide power for IP-phones or wireless transceivers on the same wires that carry the Ethernet data signals. They do this by connecting a voltage to the center-taps of each transformer in their Ethernet interface. The NAVITEK™ reports this and allows the Network testing to continue.

MAINTENANCE

Battery Replacement – When the battery low icon is on, the battery should be replaced as soon as practical. The testing results will become unreliable when the battery reaches about 5.0 volts. To replace the battery:

1. Be sure tester is off.
2. Remove rubber battery cap by pressing on edge of the cap with the heel of the hand until the cap pops off.

3. Pull battery out of cavity and remove battery snap.
4. Connect a new Alkaline 9 volt battery to battery snaps within one minute.
5. Slide battery into cavity and snap cap in place.

To preserve user set data, the unit must be off and the battery disconnected for no more than one minute.

To reset the processor – All user data will be lost.

1. Turn on tester in any mode.
2. Remove battery cap and disconnect battery.
3. Wait about 10 seconds and reattach battery leads. Length screen will appear briefly, than tester will shut down.

When installing a new battery or resetting the processor disconnect any cables connected to the tester. The length and single-ended test modes will be improperly calibrated if a cable is present when the battery is connected.

SPECIFICATIONS

Physical Dimensions

Size: 15 × 7.4 × 3.2 cm (5.9 × 2.9 × 1.25 inches)
Weight: 200 grams (7 oz.) With battery

Environmental

Operating temperature: 0 to 50 C (32 to 122 F)
Storage temperature: -30 to 80 C (-20 to 176 F)
Humidity: 10%to 90%, non-condensing

Battery Life

(9V Alkaline battery, typical) times are for the full capacity of the battery used continuously in one of the following modes:

Standby: 2.5 years
Cable Testing: 50 hours, no backlight
27 hours, 50%backlight
Network Testing: 15 hours, no backlight
14 hours, 50%backlight

Cable Types

Shielded or unshielded, CAT6, CAT5E, CAT5, CAT4, CAT3 and coax

Minimum cable length for testing split pairs – 1 meter (3 feet)

Maximum cable length for single-ended cable test – 1.25 meter (4 feet)

Length measurement range – (CAT5/6) 0 to 457 meters (0 to 1500 feet)

Appendix A: Navigation Menu for NAVITEK

Press **PWR** to turn on in last mode used or **CABLE** to turn on in Jack ID or **NTWRK** to turn on in Flash Link LED.

Mode Select The double button shown below can be pressed at any time to exit from any screen to the mode select screens.

CABLE SETUP NTWRK Press CABLE for cable modes, press NTWRK for network modes or press the center (both at once) for SETUP. SEL to enter mode.

PWR A short press toggles back light on and off. Hold to turn off tester. Auto-off in 15 min., Flash in 30 min., Tone in 60 min.

Cable Test Operating modes are:

Jack ID Determines what is connected to the jack being tested: phone, network or volts. If nothing, runs Cable Test to detect/test cable. SEL Start a new test now.

Cable Test Pretest cable from one end for shorts, opens or splits. When Remote found, complete test with wire map & remote ID #. SEL Start a new test now.

Cable Length Measure length of cable. SEL Select a pair or let tester select pair with no faults (Auto-select). ▲▼ Adjust capacitance/ft or m (CAL). ▲▼ Select length in feet or meters in SETUP.

Tone Gen Apply tone to pin, pair or all pairs. ▲▼ Select pin or pairs with tone signal. SEL Select 1 of 4 tone patterns.

Network Test Operating modes are:

Flash Link LED Detects incoming link and flashes Link LED on hub. Sends audio tone, for tone tracer with or without incoming link. SEL Start a new test now.

PING Test Sends ping requests to Target, Router and DNS devices. Tracks packet counts and response times. ◀▶ Moves 🔔 to Tgt, Rtr or DNS. SEL Shows detail for 🔔 in 3 screens, press to adv. In SETUP: Set DHCP or Manual address mode. See addresses/ mask from DHCP req. Enter manual and Target addresses.

Validate Link Sets unit to be a NIC and exchange packets with a second NAVITEK with just a cable or through a hub. Second unit runs manual Ping mode.

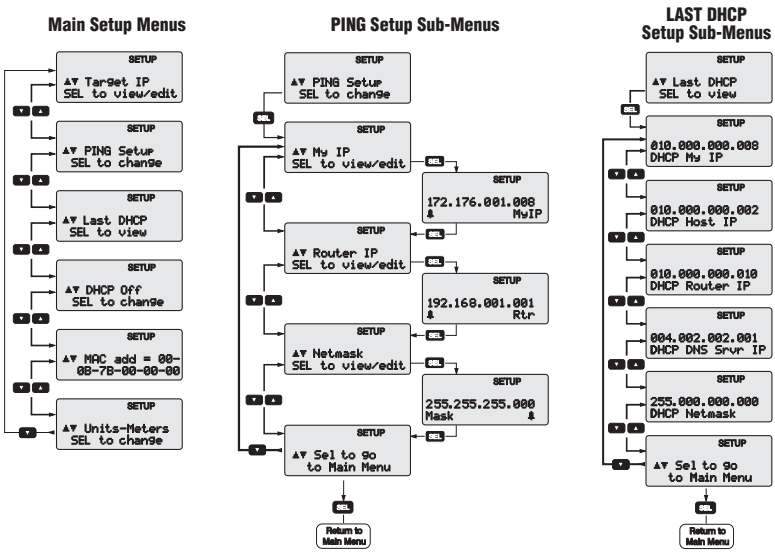
SETUP Set user selectable options. ▲▼ Scroll through options. SEL Change option, enter sub-menu or advance to next sub-menu.

Address Setting ◀▶ Moves 🔔 left or right. ▲▼ Changes value above 🔔.

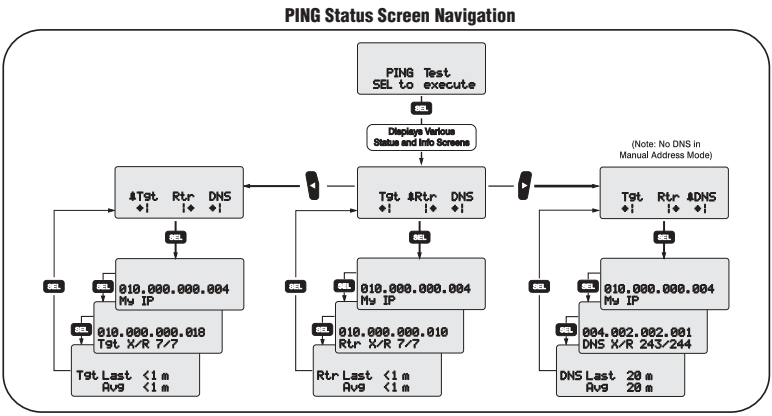
Typical Cable Length Parameters

Cable Type		pF/ft	pF/m
Data	CAT3	19.0	62.5
	CAT5/5E/6	15.0	49.0
Coax	RG58	27.5	90.0
	RG6, RG11, RG59	16.25	53.0
Security Wire	22AWG, Jacketed	24.0	78.5
	22AWG, Unjacketed	14.0	46.0
	20AWG, Unjacketed	16.0	52.5
	18AWG, Unjacketed	17.0	55.5

Appendix B: NAVITEK Setup Menu



Appendix C: PING Status Screen



Appendix D: Glossary of Networking Terms

10 Base-T – The earliest definition of Ethernet was for 10 Million Bits per second (10 Mbps). The Ethernet specification defined several different cabling schemes, including T568A/B (4-pairs of wire) and coax wiring. The 10 in 10 Base-T defines 10 Mbps and the Base-T defines T568A/B, CAT3 cabling. 10 Base-2 defines 10 Mbps over coax. Note: the NAVITEK™ PING mode works in 10 Base-T. It relies on the legacy compatibility built into all 100 Base-Tx equipment to communicate. The NAVITEK™ reports this in Jack ID mode as 10 Base-T.

100 Base-Tx – A newer Ethernet specification defines 100 Mbps data rate as an upgrade for higher network bandwidth, and several different cable schemes are defined for it. The 100 in 100 Base-Tx defines the data rate as 100 Million Bits per second. The Base-Tx defines the cable scheme as 2-pairs of wires in a T568A/B, CAT5 cable. Note: the NAVITEK™ PING mode works in 10 Base-T. It relies on the legacy compatibility built in to all 100 Base-Tx equipment to communicate.

One other cable scheme defined as Base-T4 uses 4 pairs of wires in T568A/B, CAT3 or CAT5 cable. Very few Ethernet devices use this scheme, as the 2-pair (-T) scheme dominates the market. The NAVITEK™ can recognize and report this capability in the Jack ID mode, but does not operate in this mode. The NAVITEK™ reports this in Jack ID mode as 100 Base-T4. (The NAVITEK™ can recognize this capability in Jack ID mode but reports as 100 Base-T4.)

Cross-Over Cable – An Ethernet T568A/B cable which connects the 1-2 pair on one end to the 3-6 pair on the other. This allows a NIC device to connect directly to another NIC device, or HUB to a HUB. These are often used to connect one HUB (or switch) to another HUB (or switch) to enable LAN expansion. Note: if one of the HUBs has an “UPLINK” connector, that connector can be used with a straight-through cable to connect a normal HUB port to the “UPLINK” port.

HUB – Ethernet physical wiring is done on a point-point mechanism, but an Ethernet network is a star network, where any one device can communicate directly with other devices on that network. A HUB is physical device that has multiple Ethernet connectors (ports) on it. Inside, the HUB receives incoming data from any of its ports and then transmits what it receives back out to all its ports. Thus, any communications between devices is visible to all other devices on that LAN. The HUB has no IP or MAC address of it's own. It is a “transparent” device that merely enables multiple Ethernet devices to intercommunicate.

HUBs are typically older Ethernet devices that are 10 BaseT. Most 10/100 HUB-like devices are now switches (see definition). NAVITEK™ uses HUB as a definition for a specific Ethernet connection pin assignment that allows it to connect directly to a NIC device using a straight-through cable.

MAC = Media Access Control – Protocol defined for addressing network-interfaces on a unique basis. Each manufacturer of electronic devices that interface to a MAC-controlled mechanism (like Ethernet) must register with the IEEE and get a set of unique addresses. Each device that manufacturer builds is assigned a single address from that manufacturer's set of addresses. Ethernet will not work properly if more than one device on the LAN has the same MAC address.

MDI/MDI-X = Medium Dependent Interface, X for Crossover – The physical cable interface defined in IEEE 802.3 is called MDI on one end and MDI-X on the other end. The NAVITEK™ refers to these connectors as NIC and HUB respectively. A recent development in Ethernet devices is the ability to determine what type of device is connected on the other end of the cable and adjust itself to communicate properly. HP invented this and calls it "Auto MDI/MDI-X". The NAVITEK™ will recognize and report this type of device as an AUTO device in Jack ID mode.

NIC = Network Interface Card – Typically an option card plugged into a PC card slot that provides an Ethernet interface for that PC. NAVITEK™ uses the term NIC to define the connector pin out that allows for direct connection to a HUB device using a straight-through cable.

Polarity – Ethernet transmit and receive driver chips use differential voltages to improve noise immunity. Thus each direction of transmission uses a pair of wires, one for the positive (+) side and the other for the negative (-) side. Early Ethernet interface chips were not designed to recognize and compensate for reversed cable pairs, so a crossed (+) and (-) pair could cause problems. Modern Ethernet chips can compensate, so the wiring is not critical, but the NAVITEK™ can determine the difference, and will report it. In the Jack ID mode the polarity is reported as NRM or REV.

Straight-Through Cable – An Ethernet (CAT 5) cable which connects all 4 pairs in the cable straight-through to the corresponding pairs in the far end connector. This allows a NIC device to connect directly to a HUB device.

Switch – Similar to a HUB, a switch is a multiple port Ethernet connection device that allows for multiple Ethernet devices to communicate between each other. Unlike a HUB, a switch has internal logic that determines which port a specific MAC address is found on. Once that has been determined, it only forwards traffic destined for that address to that port. This allows for fewer collisions on the LAN by not re-transmitting every packet on every port. Multiple simultaneous point-point communications can pass through a switch at the same time, as long as each end point is on a different port on the switch.

Like a HUB, a switch (in its primary mode) has no IP or MAC address of its own. Also, like a HUB, a switch uses HUB pin out on its connectors to allow direct connections to NIC interfaces. Switches are more modern devices than HUBS and are usually capable of 100 Mbit/sec (100 Base-Tx) operation.

As a result of IEEE Ethernet specs requiring downward compatibility, all 100 Mbit interfaces must also support legacy 10 Mbit communications. This results in requiring a switch to have memory to store packets received at 100 Mbits for retransmission at 10 Mbits (Store and Forward).

T568A/B – The EIA/TIA structured wiring standards for telecommunications wiring. A and B versions are electrically identical and cannot be distinguished with a wiring test. The color codes and pair numbering is different, however, and care must be taken to use one version within a network. A cable wired to A on one end and B on the other results in a cross-over cable.

UPLINK – A special connector, or a mechanical switch, that changes the pin out of one connector on a HUB or switch to NIC pin out. This allows a straight-through cable to be used to connect one HUB (or switch) to another while building a LAN.

INTERNET PROTOCOL DEFINITIONS

ARP = Address Resolution Protocol – Used to determine Ethernet (MAC) address when a device starts to communicate with another. The IP address is known and a broadcast is used to request the specific IP addressed device to respond with its MAC address, so further communication can be specifically addressed between the two.

DHCP = Dynamic Host Configuration Protocol – Used when a new IP device is added to a LAN and needs to get information about that LANs IP addresses. One DHCP server must be present on the LAN to provide a response to a DHCP request transmitted to a broadcast address informing the new device of several configuration details. ADHCP server is not required on a LAN, but if it does not exist, all the devices on the LAN must be manually configured. The DHCP server can provide much information. The NAVITEK™ requests and uses:

- an IP address for itself (My IP)
- the IP address of the DHCP server on the LAN
- the Netmask in use
- the IP address of the Router on the LAN
- the IP address of the DNS server accessible from the LAN

DNS = Domain Name Server – Provides translation of URL addresses (www.yahoo.com) to IP addresses (66.218.71.89) so that access to the internet devices can be requested using humanly understandable identifiers. DNS servers are found on the Internet, and thus are of interest to the NAVITEK™, as accessing (PINGing) the DNS server proves that it can access a device on the WAN.

Gateway = Router – see below

IP = Internet Protocol – Actually TCP/IP = Transmission Control Protocol/Internet Protocol, but commonly abbreviated to IP. Communications addressing scheme defined by DARPA (Defense Advanced Research Projects Agency) to control the publicly accessed Internet network.

IP Address – Specific number assigned to a single device allowing it to be uniquely identified on the network to which it is connected. On a LAN, the IP address must be within the range of addresses defined for that LAN by the Network Mask in use. On the Internet, all IP addresses must be universally unique to allow addressing that specific device. IP addresses consist of 4 hexadecimal digits that are commonly written in "dotted decimal" format (i.e. 192.168.254.4). Note that each set of decimal numbers divided by the periods must be in the range of 0-255 as they represent hexadecimal values of 00-FF.

ISP = Internet Service Provider – Commercial supplier of access mechanisms for public access to the Internet.

LAN = Local Area Network – Connection mechanism for a business, home, school or any group of devices to communicate with each other. In the NAVITEK™ case, it is a group of computers, printers, routers and possibly other devices connected by Ethernet. Distinct from the WAN due to the IP addressing in a "Subnet".

Network Mask = Subnet Mask – IP addressing scheme that divides the entire IP address network into smaller sections (Subnets). In the case of the NAVITEK™, the Network mask is used to identify an IP address as being located either on the LAN (local subnet) or on the Internet, and therefore accessed over the WAN.

PING = Packet Internet Groper – A simple communication protocol (ICMP Echo) used to request an echo back from an addressed device (target). The NAVITEK™ uses this to verify IP connectivity between itself and another device.

Router = Gateway – If a device is attempting to communicate with an IP address, and it finds that the target is not on its local network (by comparing the target address with its own address and the Netmask) the device must forward its' request to a router. The router forwards the communication to the target device across the WAN. This typically puts the communications on the Internet, another LAN subnet, or a private network of some other type. A router has an IP address and MAC address (on Ethernet) of its own for direct communications, which differentiates it from a HUB or switch. A hardware box sold as a router will usually include a HUB or switch chip inside, providing a convenient connection point for multiple Ethernet devices.

Target – In the PING protocol, an IP address must be selected to receive an echo request. This address is the "target" address for that PING. In the NAVITEK™, a target must be selected manually in Setup. This target can be on the LAN or anywhere else accessible through a router connected to the LAN. If the target is not on the LAN, the router IP address must be known so the PING can be sent to the router, which forwards it on toward the ultimate location.

TCP/IP = Transmission Control Protocol/Internet Protocol

WAN = Wide Area Network – The "remote" interface on a router. The WAN may be accessed via a DSL line, broadband cable connection, ISDN, T1 line or even a dial-up modem line. This term is used to loosely define the hardware path used to communicate with any IP-addressed device not on the local LAN.

IDEAL INDUSTRIES, INC.
Sycamore, IL 60178, U.S.A.
800-435-0705 Customer Assistance
www.idealindustries.com
ND-4704